

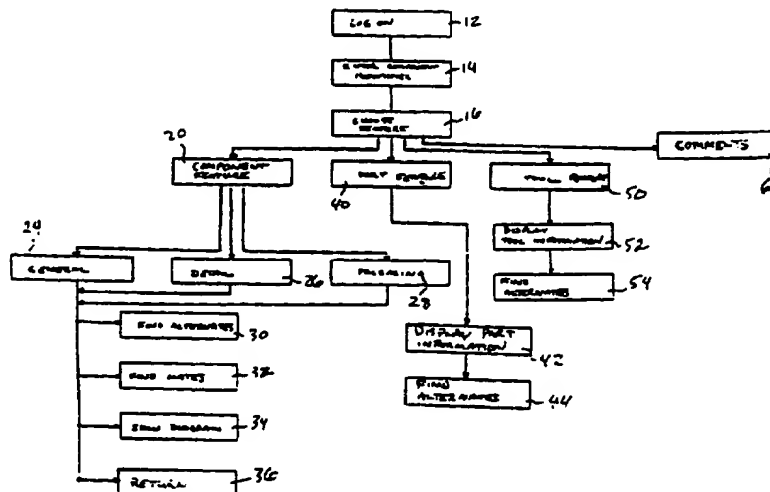


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : G06F 7/00, 17/30		A1	(11) International Publication Number: WO 97/17653
			(43) International Publication Date: 15 May 1997 (15.05.97)
(21) International Application Number: PCT/US96/17881		(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).	
(22) International Filing Date: 8 November 1996 (08.11.96)			
(30) Priority Data: 60/012,114 9 November 1995 (09.11.95) US 08/562,914 27 November 1995 (27.11.95) US			
(71) Applicant (for all designated States except US): TRAN-SQUEST, INCORPORATED [US/US]; Hartsfield Atlanta International Airport, 1001 International Boulevard, Atlanta, GA 30354-1801 (US).		Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.	
(72) Inventors; and (75) Inventors/Applicants (for US only): STONE, Jonathan, C. [US/US]; 3138 Due West Court, Dallas, GA 30132 (US). LEWALLEN, Venetia, R. [US/US]; 4080 Liberty Road, Villa Rica, GA 30180 (US). MORRISON, Jeff, A. [US/US]; 2983 Cedar Mill Crossing, Acworth, GA 30102 (US).			
(74) Agents: BOCKHOP, Bryan, W. et al.; Needle & Rosenberg, Suite 1200, 127 Peachtree Street, N.E., Atlanta, GA 30303 (US).			

BEST AVAILABLE COPY

(54) Title: METHOD AND APPARATUS FOR PROVIDING COMPONENT-RELATED INFORMATION



(57) Abstract

A method and apparatus for accessing information used by a facility includes a computer-readable memory (346) having a plurality of addresses and containing a data structure. The data structure includes a plurality of tables with a plurality of records, each having a field including a component identifier (14) or part identifier (4086) corresponding to a component (20), and a field comprising information about the component (20) or part (40) corresponding to the component identifier (14) or part identifier (4086). Fees are assessed for access to the table by a user having an account. A selected display of information stored in the database is designated as a pay screen. An instance of a user accessing the pay screen is recorded. A predetermined fee for each recorded use of the pay screen by the user is assessed to the user's account.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MN	Mongolia	UZ	Uzbekistan
GA	Gabon	MR	Mauritania	VN	Viet Nam

METHOD AND APPARATUS FOR PROVIDING COMPONENT-RELATED INFORMATION

REFERENCE TO MATERIAL SUBJECT TO COPYRIGHT PROTECTION

5

A portion of the disclosure of this patent document contains material which is subject to copyright protection. The copyright owner has no objection to the facsimile reproduction by anyone of the patent disclosure, as it appears in the Patent and Trademark Office patent files or records, but otherwise reserves all copyrights
10 whatsoever.

1. Field of the Invention

The present invention relates to information processing and, in particular, to a
15 method and apparatus for processing maintenance facility-related information.

2. Description of the Prior Art

Typical complex mechanical platforms often comprise thousands of components
20 that must be replaced or overhauled regularly. These components often comprise several parts and usually require specific tools for their extraction and subsequent re-insertion. For example, if the platform is a commercial aircraft, an electrical connector would be one type of component and the contact pins and backshell of the connector would be constituent parts of the component. Finding information about these
25 components, parts and tools can be a complicated process for the technician.

In replacing a specific component of a platform, a technician typically references a schematic diagram corresponding to the individual platform being worked on to find a symbol corresponding to the individual part being replaced. Next to the symbol, is an
30 Equipment List Designator (ELD) number. The ELD number uniquely identifies the specific component and its location on a specific platform. Next, the technician accesses a cross-reference manual to find the user-specific part number corresponding to the ELD number. Typically each user, such as an airline, will have its own unique list of

part numbers describing the components found on all of its platforms. Once the user-specific part number is found, the technician can order the component using the user-specific part number from the user's inventory system. However, if the component is not available from the user's inventory system, the technician must then access another cross-reference manual to find the manufacturer's part number. The component is then ordered directly from the manufacturer or some other source.

Sometimes the original component is no longer available from the manufacturer, or the technician may not want to use the component from the original manufacturer due to cost or other considerations. For example, the original manufacturer may have sharply increased its price for a given component, or it might not supply a given part to a particular geographic market. In this case, the technician will attempt to find an equivalent to the original component. In the case of aircraft maintenance, the technician is required by federal aviation administration (FAA) regulations to find a substitute component having attributes of form, fit and function that equal or exceed the form, fit and function attributes of the original component. For example, if the original component is an electrical connector used in a commercial aircraft, a suitable substitute connector must have the same general shape as the original connector (the same form), it must be complimentary to the mate of the original connector (the same fit), and it must be able to withstand the same operating conditions (*e.g.*, temperature) and transfer signals in the same way as the original connector (the same function).

Finding such a suitable substitute component can be a laborious process. Typically, a technician must search through several different manufacturer's parts manuals, find what appears to be a suitable substitute component and then compare each attribute of the desired substitute to each attribute of the original component. The technician must also look up the required tooling for a component, as FAA regulations often mandate that a given component be worked on only with a specific tool. Maintenance facilities usually keep *ad hoc* lists of data about suitable substitute components for many of the original components they use, but these lists are often incomplete and frequently contain outdated information.

The technician time wasted in looking up components and in trying to find suitable substitutes for components can be very costly. One airline estimates that in 1994 alone its cost spent in searching for component-related repair information was over \$500,000.00. In addition to that figure, it lost over \$500,000.00 due to the cost of flight delays due to electrical connector repair problems alone. Were there a system that automated the process of finding suitable substitute components, a major carrier could save over \$1,000,000.00 per year in maintenance and repair costs.

Furthermore, sometimes a technician does not know an actual part number for a needed component, but knows only the form, fit and function of a desired component. This is especially true in design facilities, where engineers must find a suitable component for a given function from all of the components available. Because of the time involved the technician or engineer will frequently use the first component found having suitable form, fit and function. Rarely will the technician or engineer perform a comprehensive cost and function analysis to find the optimal component. This can result in the disadvantage of platforms, such as commercial aircraft, being repaired and designed with less than optimal components, and can also result in the disadvantage of considerable aggregate cost inefficiency occurring due to the use of non-competitively priced components.

20

There are some systems that effectively act as computerized parts lists of various components. These allow the user to search on various criteria, much in the same way that a user would look through a technical manual. However, they have the disadvantage of not seeking out substitute components having equivalence in form, fit and function. They also have the disadvantage of not being able to search for components having specific attributes. Thus, the time saved by these systems is marginal, as a user must go through roughly the same process in searching for substitute components.

30

Currently, no system exists that automatically finds suitable substitutes for components used in various platforms and provides comprehensive related information

about the components. Furthermore, no system exists that automatically finds suitable components of platforms in response to a query, based on a selected set of desired attributes of a component.

5

SUMMARY OF THE INVENTION

1. Aspects of the Invention

One aspect of the invention is a method of comparing components to determine which of a set of components is an acceptable substitute for a primary component, each of the components having at least one attribute. A first set of data including a plurality of component identifiers and a plurality of component values is accessed. Each of the component identifiers corresponds to a component and each of the component values corresponds to a particular attribute associated with a component corresponding to one of the plurality of component identifiers. A primary component identifier of the plurality of component identifiers is selected. The primary component identifier corresponds to the primary component. Using preselected criteria, at least one component value corresponding to at least one selected attribute associated with the primary component is compared to a set of the plurality of component values, thereby determining which components are acceptable substitutes for the primary component. A list of components so determined to be acceptable substitutes for the primary component is then generated and displayed. This method may be implemented on a digital computer having a computer readable memory on which is stored the first set of data.

Another aspect of the invention is a method of employing a computer to select at least one component from a set of components, where each of the components has at least one attribute. A set of data including a plurality of component identifiers and a plurality of values is accessed. Each of the component identifiers corresponds to a component and each of the values corresponds to an attribute associated with a component corresponding to one of the plurality of component identifiers. An attribute of a desired component is selected and at least one first value corresponding to the

selected attribute associated with the desired component is entered into the computer. The first value is compared to a subset of the plurality of values associated with the selected attribute, thereby determining which of the components are associated with the selected attribute having a value equal to the first value. A first list of component
5 identifiers corresponding to components so determined to have values of the selected attribute equal to the first value is then generated and displayed. This method may be implemented on a digital computer having a computer readable memory on which is stored the set of data.

10 Another aspect of the invention is a series of operational steps, to be performed by a digital computer having a memory, for comparing components, each of the components having at least one attribute, to determine which of a set of alternate components is an acceptable substitute for a primary component. A set of data stored in the memory is accessed. The set of data includes a plurality of component identifiers,
15 with each of the component identifiers corresponding to a component, and a plurality of values, with each of the values corresponding to a particular attribute associated with a component. Input is received from a user, the input indicating a primary component identifier of the plurality of component identifiers, with the primary component identifier corresponding to the primary component. A portion of the memory is searched and at
20 least one value corresponding to a selected attribute associated with the primary component is compared, using preselected criteria, to a set of the plurality of values, thereby determining which of the set of alternate components is an acceptable substitute for the primary component. Each one of the set of plurality of values corresponds to the selected attribute associated with one of the set of alternate components. A list of
25 component identifiers of components so determined to be acceptable substitutes for the primary component is then generated and displayed.

Another aspect of the invention is an apparatus for accessing information used by a facility. The apparatus includes a computer readable memory having a plurality of
30 memory addresses and containing a data structure stored therein. The data structure includes a first table, stored in the memory, with the first table including a first plurality

of records. Each of the first plurality of records includes a first data field including a component identifier corresponding to a component, at least one second data field including a part identifier corresponding to a part included in the component corresponding to the component identifier included in the first data field, and at least one
5 third data field having information about the component corresponding to the component identifier included in the first data field. The data structure also includes a second table, stored in the memory and including a second plurality of records. Each of the second plurality of records includes a fourth data field that includes information about the part corresponding to a part identifier included in the second data field. The
10 data structure also includes a plurality of first pointers, where each first pointer points to a memory address at which a selected one of the second plurality of records in the second table is stored, with each of the first pointers being associated with a part identifier included in the first table.

15 Another aspect of the invention is a computer system for accessing information about a plurality of components that includes an apparatus for accessing information used by a maintenance facility. The apparatus includes a computer readable memory having a plurality of memory addresses and containing a data structure. The data structure includes a table, stored in the memory, that includes a plurality of records.
20 Each of the plurality of records includes a first data field including a component identifier corresponding to a component and at least one second data field including a value for an attribute associated with the component. The system also includes a computer processor and a memory storing a computer program. The program directs the operation of the processor to access the table and receive input from a user
25 indicating a selection by the user of a component identifier in the table corresponding to a primary component. The program also directs the computer to compare, using preselected criteria, at least one value corresponding to at least one selected attribute associated with the primary component to each second data field of a set of the plurality of records, and thereby determine which components are acceptable substitutes for the
30 primary component. The program then directs the computer to generate and display a

list of components so determined to be acceptable substitutes for the primary component.

Another aspect of the invention is a method of assessing fees for access to a data base by a user having an account. At least one selected first display of information stored in the database and accessible by the user is designated as a pay screen. At least one instance of the user accessing the pay screen is recorded. A predetermined fee for each recorded use of the pay screen by the user is assessed to the user's account.

10

2. Utility of the Invention

The invention has many practical utilities. Among other things, the utility of the invention includes providing a user with the ability to quickly find suitable substitutes for a selected component, the substitutes being at least equivalent to the selected component with respect to attributes of form, fit and function. The utility of the invention also includes automating the process of providing a user with information about selected components. The utility of the invention also includes providing a user with the ability to quickly identify a component by entering into a computer attributes of form, fit and function associated with the desired component. The utility of the invention also includes providing a server with the ability to selectively assess charges to accounts for each use of the system based on a per-screen basis.

These and other aspects and utilities of the invention will become apparent from the following description of the preferred embodiment taken in conjunction with the following drawings. As would be obvious to one skilled in the art, many variations and modifications of the invention may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

30

BRIEF DESCRIPTION OF THE FIGURES OF THE DRAWINGS

FIG. 1 is a simplified transition diagram of some of the states that can be accessed by the invention.

5

FIGS. 2A-2J are views of a representative sample of the screen displays corresponding to various states of one embodiment of the invention.

FIG. 3 is a schematic diagram of one embodiment of the invention.

10

FIG. 4A is a simplified entity relationship diagram showing the basic data structure employed in the invention.

FIG. 4B is a simplified memory space diagram showing one implementation of the data structure shown in **FIG. 4A**.

15

FIG. 5 is a an entity relationship diagram showing the data structure employed in one embodiment of the invention.

20

DETAILED DESCRIPTION OF THE INVENTION

A preferred embodiment of the invention is now described in detail. Referring to the drawings, like numbers indicate like parts throughout the views.

25 1. **Definitions**

As used in the description herein and throughout the claims, the following terms take the meanings explicitly associated herein, unless the context clearly dictates otherwise:

30

“A,” “an,” and “the” includes plural reference.

"In" includes "in" and "on."

"Facility" means any facility that uses information about components and parts thereof.

5 Illustrative examples of facilities includes maintenance facilities, warehouses, design facilities, *etc.*

10 "Platform" means any device that is maintained at a facility. Illustrative examples of platforms include aircraft; trains, factory equipment, buildings, *etc.*

"Component" means any assemblage used by or kept at a facility.

15 "Part" means any constituent unit of a component. As used in the present application, a part may also be an assemblage of several constituent units. Such a part is thus treated as a component when referred to in the context of being an assemblage, and its constituent units are treated as parts.

20 "Pointing and clicking" means indicating a selection by placing a cursor, represented as an arrow, at an area of interest, using an input device (*e.g.*, a mouse of the type commonly used with personal computers) and depressing an input button on the input device, as is common with several contemporary operating systems.

25 "Component Identifier" means any code that could uniquely identify a component and could include a manufacturer's part number, an equipment list designator, a milspec number, a warehouse number, a user's part number, or any other code used in a component identification system. Similarly, "part Identifier" means any code that could uniquely
30 identify a part.

2. Description

The invention is a system that allows a technician to search a database
5 comprising information about a plurality of components and find an acceptable
substitute for a desired component. It also allows a technician, or other user, to find a
desired component based on the values of several attributes. (Such attributes indicate
the form, fit and function of the component and could include such attributes as:
temperature rating, material code, finish type, or any other attribute relevant to the
10 function of a component.) When a component is found by the system, it displays
various types of information about the component and its constituent parts.

A simplified state transition diagram implementing the invention is shown in FIG.
1 (detailed state transition diagrams, upon which a computer program implementing a
15 first embodiment of the invention, can be found in Appendix A of the microfiche
appendix). The system first enters a log-on state 12 in which the user enters any
necessary log on information (*e.g.*, user ID, pass word, *etc.*). Once any logon
conditions (*e.g.*, verification of password) are satisfied, the system enters a state 14 in
which the user has the option to enter a component identifier, if known. Once the user
20 has entered a component identifier (or has entered a blank), the system proceeds to a
state 16 wherein the user is asked to choose a feature. The selectable features include:
the component feature 20, the part feature 40, the tool feature 50 and the comments/
questions feature 60.

25 If the user chooses the component feature 20 the system enters one of three
states corresponding to one of three user-chosen options: the general state 24, the detail
state 26 and the packaging state 28. In the general state 24, the system provides the
user with general attribute information about a selected component. In the detail state
26 the system provides information specific to a given component. In the packaging
30 state 28 the system provides the user with information about what is included in a
package with a selected component (*e.g.*, what tools and ancillary parts are included).

Regardless of the option, the user can always cause the system to enter one of the following states: find alternates 30, in which the system finds alternate components or parts having the same form, fit and function as a selected component or part; find mates 32, in which the system finds components having complementary function to a selected component; show diagram 34, in which the system displays a diagram of a selected component; and return 36, in which the system returns to the first listed component after having displayed information about alternate components.

If the user chooses the part feature 40, the system enters a state 42 in which it displays information about a selected part of a selected component. The user may then cause the system to enter a state 44 in which the system finds suitable alternate parts having the same form, fit and function as the selected part.

If the user chooses the tool feature 50, the system will display information about the tools required in association with a selected component. The user may then cause the system to enter a state 54 in which the system finds suitable alternate tools for a selected tool.

If the user chooses the comments/ questions feature 60 the system allows the user to input information. Such information could comprise, for example, requests for information about components not yet included in the data structure. This feature 60 could be used to provide a communications link between a user and a technical representative. It could also be used to perform statistical consumer analysis on the various users of the system.

25

As shown in FIG. 2A, several screens are initially presented to the user. This embodiment of the invention is directed to providing information about electrical connectors used on aircraft. Such connectors are considered to be components, and the constituent parts of the components include such parts as contacts, backshells and sealing plugs used to seal the respective connectors during periods of nonuse.

30

First, a logon screen 200 requires the user to enter a logon ID and a password. After the correct password has been entered, the system presents the user with a manufacturer's part number screen 202, which allows the user to input a manufacturer's part number if known. Next, the system presents a main screen 204, which allows the
5 user to select a desired feature.

As shown in FIG. 2B, a main connector screen 208 presents to the user a dynamic information area 206 and a static information area 230. The static information area 230 displays information that is not changeable by the user. The dynamic
10 information area 206, on the other hand, displays information and allows the user to input information. In this embodiment, the dynamic information area 206 is displayed as a series of representations of three index cards 210, 212, and 214. The general card 210 allows the user to access general attribute information about a selected connector. If the user points and clicks on the detail card 212, the system presents a display (FIG. 2C)
15 showing detailed attribute information about the selected connector. Similarly, if the user points and clicks on the packaging card 214, the system displays a screen (FIG. 2D) with packaging attribute information about the selected connector. (Packaging information indicates which items are packaged with the connector. These items may include a backshell, all of the necessary contacts, and the tools required for connector
20 installation.)

Returning to FIG. 2B, on the main connector screen 208 there are several icons on which a user can point and click to receive specific information or perform specific operations. These include a "disconnect" icon 236 that allows the user to disconnect
25 from the system at any time. The user can point and click on an "alternate" icon 224, which causes the system to search for other connectors having attributes that are as good or better than as those listed on the general card 210 and present a display (FIG. 2E) providing connector information about suitable alternates. Some of the attributes require an exact match in order for the corresponding connector to be included on the
30 list. For example, the system searches for connectors having an insert configuration identical to that of the selected connector, whereas the system search for connectors

having a temperature rating at least equal, but possibly better than that of the selected connector. The user can also change the attribute information on the general card 210 and then point and click on the alternate icon 224 to find a list of connectors having attributes identical to the displayed attributes.

5

Returning to FIG. 2B, the user can also point and click on a "mates" icon 226 that causes the system to find connectors that are complimentary in function to the displayed connector. For example, if the displayed connector is a 16-pin male connector, upon pressing the mates icon 226, the system would present a list of 16-pin
10 female connectors. When the user points and clicks on a "diagram" icon 228, the system displays a diagram (FIG. 2F) of the connector listed on the general card 210. Such a diagram could take many forms, including: a pin diagram of the connector, a drawing of the connector, or even a digitized photograph of the connector.

15

Returning to FIG. 2B, several feature icons are provided at the top of the screen to allow the user to easily go back and forth between features. These include: a "connector" icon 216, which allows the user to access the connector screen 208 at any time; a "contact" icon 218 which allows the user to access a screen (FIG. 2G) with information about contacts associated with a selected component; a "tool" icon 220,
20 which allows the user to access a screen (FIG. 2H) with information about the tools necessary for installation and removal of the selected connector or part thereof; a "sealing plug" icon 232, which allows the user to access a screen (FIG. 2I) with information about sealing plugs used in association with a selected connector; and a "backshell" icon 21, which allows the user to access a screen (FIG. 2J) with information
25 about backshells associated with a selected connector. As would be obvious to one skilled in the art, many other icons could be employed to tailor the invention to a specific type of component and its constituent parts without departing from the scope of the invention.

30

Each time a user accesses the connector screen, the contact screen, the tool screen, the sealing plug screen or the backshell screen, the system will assess a fixed

charge for access to the screen. This way of assessing fees for access to designated "pay screens" differs from the conventional way of fee assessment used by other on-line services in that the user is charged on a per-screen access basis rather than on a timed basis. This offers the advantage of giving the server the ability to charge a user based on the amount of information accessed rather than on the time spent logged on to the system. Furthermore, it allows the user to remain logged onto the system for long periods without being charged for idle time, thus making continuous use of the system more attractive to users.

10 As shown in FIG. 3, the system 300 may connect a maintenance facility 310 to an information supplier 340 via either a commercial data network 330 or conventional telephone lines 332 or both. In the system shown, the maintenance facility 310 has at least one work station 314 that is connected to the commercial data network 330 through a local area network 312 (LAN). The commercial data network 330 is
15 connected to a LAN 344 belonging to the information supplier 340. LAN 344 is in communication with a server 342, which could comprise a general purpose digital computer or a digital computer specifically designed for transaction processing. The server has an associated memory 346 capable of storing a data base including the information about components and parts provided by the system 300. The memory 346
20 could take the form of a fixed magnetic medium, on-board computer memory chips, optical storage, or any other type of conventional computer memory (as would be obvious to one skilled in the art of computer system design). Also connected to LAN 344 is at least one work station 354 which can be used by an operator for accessing information in association with telephone queries or for any other conventional use
25 (such as system maintenance).

The maintenance facility 310 may also communicate with the information supplier 340 via the telephone system 332. In this case, work station 314 is connected to a modem 316 that communicates through the telephone system 332 with a modem
30 348 connected to the server 342. Either the user's work station 314 or the server 342, or both, may be connected to facsimile machines 318, 350. Thus queries, results or both

may be communicated via facsimile transmission. The user may also use a telephone 320 to communicate with the information supplier 340. In this case the user telephones queries to an operator (not shown) using telephone 352. In this case, the operator either telephones or faxes the results of the query to the user. As would be obvious to one skilled in the art, many ways of communicating user queries to the system are possible, including: using voice recognition equipment for receiving spoken queries, using dedicated hardware, or any other way of communicating queries to an information supplier.

10 The memory 346 stores component and part data in the form of a relational data base. The data base comprises a data structure that relates information about components to information about parts. As shown in FIG. 4A, a simplified basic data structure 400 of the data base comprises a component information table 402, a part information table 420 and a rule 430 for relating table 420 to table 402. In the
15 embodiment of FIG. 4A, the component information table 402 comprises a plurality of records 404. Each record 404 comprises: a data field 406 storing a component identifier, at least one data field 408a storing a part identifier; a pointer 412 associated with a respective part identifier 408a; and at least one data field 410 storing information about the component identified in the component identifier data field 406. Each part
20 identifier 408a could identify a different part of a component. For example, if the component is a particular electrical connector, one part identifier could identify a backshell associated with the connector, another part identifier could identify a contact associated with the connector, *etc.* Similarly, the component information data field 410 could include values of attributes associated with a component, the availability of a
25 component, the cost of a component, or any other information commonly associated with a component.

 The part information table 420 comprises a plurality of records 424. Each record comprises a data field 408b storing a part identifier corresponding to a part
30 identifier stored in a data field 408a in the component table 402, and at least one data field 422 storing information about the identified part. The rule 430 is the convention

followed in recognizing and using a pointer 412 to find a given part record 424, as is obvious to those skilled in the art of data structure design.

As shown in FIG. 4B, one embodiment of the memory space 440 used to store the data structure 400 comprises a first portion 442 of memory, having a plurality of memory locations 446, and a second portion 444 of memory, also having a plurality of memory locations 446. A first memory location 450 stores a component identifier, a second adjacent memory location 452 stores a part identifier, a third memory location 454 stores a pointer associated with the part identifier stored in memory location 452. The pointer is a memory address of a part identifier 460 corresponding to the part identifier stored in memory location 452. Also near memory location 450 is a memory location 456 storing component information. Near the part identifier memory location 460 is at least one memory location 462 storing part information. This memory diagram is provided for illustrative purposes only, as would be obvious to one skilled in the art, many other configurations of memory space could be employed without departing from the scope of the invention.

As shown in FIG. 5, a detailed entity relationship diagram of one embodiment of the invention used to access to information about electrical connectors, the data structure 500 of the data base involves many tables and complex relationships. Although only an illustrative set of relationships will be discussed explicitly herein, definition tables for the relationships of FIG. 5 are given in Appendix B of the microfiche appendix. Also, as shown in FIG. 5, cardinality of relationships is expressed using connecting lines between tables and symbols at their termini. An one (1) at a terminus indicates single cardinality for the data in a data field, whereas an infinity symbol (∞) indicates multiple cardinality. Thus, a line connecting two data fields having one terminus with a one next to it and the other terminus with an infinity symbol next to it indicates a "one-to-many" relationship between the data fields. A one-to-many relationship indicates that from a single data field the system can access many corresponding data fields, as is generally known to the art of software design.

As shown in FIG. 5, the primary table is the "connector" table 502, which comprises several data fields. For example, "conn_id" is the component identifier; "mfr_part_nbr" is the manufacturer's part number corresponding to a given connector; "tmp_rating_nbr" is a code indicating a temperature rating for the connector, etc. By
5 accessing one of these data fields, the system can then access one of the other tables providing more detailed information about the aspect of the connector relating to the selected data field.

If, for example, the user accesses the "backshell_id" data field in table 502, the
10 system then accesses the "backshell" table 508, which then allows the user to access more information about a plurality of backshells associated with the selected connector. Such information includes: a code indicating whether a selected backshell is self locking (stored in the "self_lock_fl" data field); a code indicating the size of the backshell (stored in the "shell_size_nbr" data field); a code indicating the material that the
15 backshell is made from (stored in the "matl_cd" data field); *etc.* The system can also access the backshell table 508 indirectly through a logical connection table 506 by accessing only the conn_id data field in the connector table 502. A logical connection table, such as table 506 is a table that does directly not provide the user any information, but merely provides a logical link between two other information-storing tables.

20

Some relationships can be rather complex. For example, in order to receive information about sealing plugs associated with a given connector, the system first accesses the "connector logical" table 516 to gain access to the "connector gauge tool" table 518. This allows the system to access the "contact logical" table 520, which
25 allows access to the "sealing plug" logical table 522. This in turn allows access to the "sealing plug configuration" table 524 and then finally allows access to the "sealing plug" table 526, which has all of the necessary information about sealing plugs associated with a given connector.

30 Other tables in the data structure 500 include: the "image" table 562, which allows access to visual images, such as diagrams of a selected connector; the "contact"

table 554, which allows access to information about the electrical contacts associated with a selected connector; the "tool" table 546, which allows access to information about the various tools required for installation and removal of a selected connector, or part thereof (As can be seen, several copies of the tool table 546 are presented in FIG. 5, this is only to reduce the number of lines on the diagram.); the "storage location" table 544 indicates the location in a warehouse where a selected connector is stored; the "equipment list designator" table 558 cross references a user's equipment list designator number to the system's component identifier; the "aircraft" table 560 uniquely identifies a platform (in this case an aircraft) which uses a given connector; and the "manufacturer" table 536 identifies the manufacturer of a selected connector. The above discusses only a representative number of the tables in FIG. 5 for illustrative purposes only.

One embodiment of the present invention comprises a main program written in the Visual C++ programming language in object oriented format. When any request is received that requires an access to the data structure, the flow of control is passed to a monitor routine. The monitor routine then passes control to a data base wrapper routine written in a structured query language (SQL). The data base wrapper calls an appropriate SQL procedure that accesses the required data field in the data structure. Once the SQL procedure has found the correct data field, it passes the data to the data base wrapper routine, which passes it to the monitor routine. The monitor routine then presents the data to the main program, which displays the data in the appropriate format.

Source code for these routines are found at Appendix C of the microfiche appendix. A user's guide that corresponds to the code of Appendix C is provided in Appendix D of the microfiche appendix.

The execution of the program involves first accessing a component table. A primary component identifier is selected by the system from the table. The system compares, using preselected criteria, at least one component value corresponding to at least one selected attribute associated with the primary component to a set of

component values in the component table, or other related tables, thereby determining which components are acceptable substitutes for the primary component. Then the system generates and displays a list of components determined to be acceptable substitutes for the primary component. The system may also select a selected part
5 identifier from one of the tables containing part information and compare, using preselected criteria, at least one value corresponding to at least one selected attribute associated with the part identifier to a set of part values to determine which parts are acceptable substitutes for the selected part. The system then generates and displays a list of parts determined to be acceptable substitutes for the selected part.

10

The system can also access a set of data comprising a list of platforms. The user selects a platform from the set of data and the system displays a list of component identifiers corresponding to components found on the platform. The user then selects a component identifier from the list of component identifiers and the system accessing the
15 component table based on the selected part number. In fact if the set of platform data comprises a schematic diagram of a system with each component identifier being represented symbolically at a unique location on the diagram. The user can access information about a component by pointing and clicking at a location of a symbol representing a component identifier.

20

Another way of selecting a component using the system includes using a bar code reader to read a selected bar code from a component and then transmitting the thus read selected bar code to a computer.

25 The system may be configured with a direct link to a warehouse. The user may thus transmit an order for a selected component to a warehouse or a component supply facility. In this case, the system automatically accesses a database that comprises an indication the quantity of the selected component on hand at the component supply facility and reduces the quantity indication, thereby updating the database to reflect the
30 order of the selected component.

It will be readily appreciated that many other combinations of tables and relationships may perform the same function in the same way to achieve the same result, differing only to tailor the information accessed to a specific application. As would be obvious to one skilled in the art, the invention could easily be adapted to provide
5 information about many other types of components. These include, but are not limited to, hydraulic systems, gas turbine components, computer-related components, heavy industrial equipment, automotive components, *etc.* Any adaptation of the system disclosed herein to provide access to information about components would fall within the scope of the invention.

10

The above described embodiments are given as illustrative examples only. It will be readily appreciated that many deviations may be made from the specific embodiments disclosed in this specification without departing from the invention. Accordingly, the scope of the invention is to be determined by the claims below rather than being limited
15 to the specifically described embodiments above.

CLAIMS**What is claimed is:**

1. A method of comparing components to determine which of a set of components is an acceptable substitute for a primary component, each of the components having at least one attribute, comprising the steps of:
 - a. accessing a first set of data comprising a plurality of component identifiers, each of said component identifiers corresponding to a component, and a plurality of component values, each of said component values corresponding to a particular attribute associated with a component corresponding to one of said plurality of component identifiers;
 - b. selecting a primary component identifier of said plurality of component identifiers, said primary component identifier corresponding to the primary component;
 - c. comparing, using preselected criteria, at least one component value corresponding to at least one selected attribute associated with the primary component to a set of said plurality of component values, thereby determining which components are acceptable substitutes for the primary component; and
 - d. generating and displaying a list of components so determined to be acceptable substitutes for the primary component.
2. The method of Claim 1, wherein said first set of data comprises a plurality of data fields, each data field containing information about a respective component included in said first set of data and further comprising the step of generating and displaying information about each of said list of components so determined to be acceptable substitutes for the primary component.

3. The method of Claim 1, wherein the first set of data comprises a plurality of part identifiers, each part identifier corresponding to a part associated with a respective component and a plurality of part values, each value corresponding to an attribute associated with a part, the method further comprising the steps of:
 - a. selecting a first one of the part identifiers corresponding to a first part;
 - b. comparing, using preselected criteria, at least one value corresponding to at least one selected attribute associated with the first part identifier to a set of said plurality of part values, thereby determining which parts are acceptable substitutes for the first part; and
 - c. generating and displaying a list of parts so determined to be acceptable substitutes for the first part.
4. The method of Claim 1, wherein said first set of data comprises a plurality of data fields, each data field containing information corresponding to a visual representation of a respective component included in said first set of data and further comprising the step of generating and displaying a visual representation of a selected component .
5. The method of Claim 1, wherein the selected attribute is a temperature rating associated with each component and wherein the comparing step comprises determining if the value for the primary component is equal to each one of said set of said plurality of values.
6. The method of Claim 1, wherein the selected attribute is a temperature rating associated with each component and wherein the comparing step comprises determining if the value for the primary component is greater than each one of said set of said plurality of values.
7. The method of Claim 1, wherein the selected attribute indicates a constituent material associated with each component with each value for the selected attribute corresponding to a quality rating number and wherein the comparing

step comprises determining if the value for primary component is equal to each one of said set of said plurality of values.

8. The method of Claim 7, wherein the comparing step further comprises determining if the value for the primary component is greater than each one of said set of said plurality of values.
9. The method of Claim 1, wherein the selected attribute indicates a packaging description associated with each component with each value for the selected attribute corresponding to a packaging code and wherein the comparing step comprises determining if the value for primary component is equal to each one of said set of said plurality of values.
10. The method of Claim 1, wherein the selected attribute indicates a coupling type associated with each component with each value for the selected attribute corresponding to a coupling code and wherein the comparing step comprises determining if the value for primary component is equal to each one of said set of said plurality of values.
11. The method of Claim 1 further comprising the steps of:
 - a. accessing a second set of data comprising a list of platforms;
 - b. selecting a first platform from the second set of data;
 - c. displaying a list of component identifiers corresponding to components found on the first platform;
 - d. selecting a component identifier from said list of component identifiers; and
 - e. accessing the first set of data based on the selected part number.
12. The method of Claim 1, wherein the first set of data comprises a schematic diagram of a system with each component identifier being represented

symbolically at a unique location on the diagram and wherein the selecting step comprises:

- a. placing a cursor at a location of a symbol representing a component identifier; and
- b. indicating a selection of the component identifier at the location of the cursor.

13. The method of Claim 1, wherein each component has a bar code label affixed thereto and the selecting step comprises:
 - a. using a bar code reader to read a selected bar code from a component; and
 - b. transmitting the thus read selected bar code to a computer.
14. The method of Claim 1 further comprising the step of transmitting an order for a selected component from the list of acceptable substitutes to a component supply facility.
15. The method of Claim 14 further comprising the steps of:
 - a. accessing a database that comprises an indication the quantity of the selected component on hand at the component supply facility; and
 - b. reducing the quantity indication, thereby updating the database to reflect the order of the selected component.
16. A method of employing a computer to select at least one component from a set of components, each of the components having at least one attribute, comprising the steps of:
 - a. accessing a set of data comprising a plurality of component identifiers, each of said component identifiers corresponding to a component, and a plurality of values, each of said values corresponding to an attribute associated with a component corresponding to one of said plurality of component identifiers;

- b. selecting an attribute of a desired component;
 - c. entering into the computer at least one first value corresponding to the selected attribute associated with the desired component;
 - d. comparing the first value to a subset of said plurality of values associated with the selected attribute, thereby determining which of the components are associated with the selected attribute having a value equal to said first value; and
 - e. generating and displaying a first list of component identifiers corresponding to components so determined to have values of the selected attribute equal to said first value.
17. The method of Claim 16 further comprising the step of determining which of the components are associated with the selected attribute having a value greater than said first value.
18. The method of Claim 16 further comprising the step of generating and displaying a second list of information items, each information item being associated with a selected component of the first list.
19. The method of Claim 18, wherein the second list displaying step comprises displaying a unit cost corresponding to each of the components on said first list.
20. The method of Claim 18, wherein the second list displaying step comprises displaying a temperature rating code corresponding to each of the components on said first list.
21. The method of Claim 18, wherein the second list displaying step comprises displaying a material code corresponding to each of the components on said first list.

22. The method of Claim 18, wherein the second list displaying step comprises displaying a packaging type corresponding to each of the components on said first list.
23. The method of Claim 18, wherein the second list displaying step comprises displaying a coupling type corresponding to each of the components on said first list.
24. The method of Claim 18, wherein the second list displaying step comprises displaying a style code corresponding to each of the components on said first list.
25. A series of operational steps, to be performed by a digital computer having a memory, for comparing components, each of the components having at least one attribute, to determine which of a set of alternate components is an acceptable substitute for a primary component, comprising the steps of:
 - a. accessing a set of data stored in the memory and comprising:
 - i. a plurality of component identifiers, each of said component identifiers corresponding to a component; and
 - ii. a plurality of values, each of said values corresponding to a particular attribute associated with a component;
 - b. receiving input from a user indicating a primary component identifier of said plurality of component identifiers, said primary component identifier corresponding to the primary component;
 - c. searching a portion of the memory and comparing, using preselected criteria, at least one value corresponding to a selected attribute associated with the primary component to a set of said plurality of values, wherein each one of said set of plurality of values corresponds to the selected attribute associated with one of the set of alternate components, thereby determining which of the set of alternate components is an acceptable substitute for the primary component; and

- d. generating and displaying a list of component identifiers of components so determined to be acceptable substitutes for the primary component.
- 26. The series of operational steps of Claim 25, wherein the selected attribute comprises a number indicating a predetermined level of quality associated with the component.
 - 27. The series of operational steps of Claim 25, wherein the searching step comprises determining if one of said set of plurality of values is at least equivalent to said value corresponding to said selected attribute associated with the primary component.
 - 28. The series of operational steps of Claim 27 further comprising the step of determining a unit cost corresponding to a selected component.
 - 29. The series of operational steps of Claim 27 further comprising the step of generating and displaying a diagram corresponding to a selected component.
 - 30. The series of operational steps of Claim 27 wherein the generating and displaying step includes displaying a selected list of attributes associated with a selected component.
 - 31. The series of operational steps of Claim 27 further comprising the step of determining a location where a selected component may be found.
 - 32. The series of operational steps of Claim 27 further comprising the step of determining the availability of a selected component.
 - 33. The series of operational steps of Claim 32 comprises determining a stock quantity of the selected component at a selected warehouse.

34. The series of operational steps of Claim 27 further comprising the step of determining which tools are associated with a selected component.
35. The series of operational steps of Claim 27 further comprising the step of determining a location where a tool associated with a selected component may be found.
36. The series of operational steps of Claim 27 further comprising generating and displaying a list of parts associated with a selected component.
37. The series of operational steps of Claim 25 further comprising the steps of:
 - a. accessing a list of mates, stored in the memory, each mate being complimentary in function to at least one component; and
 - b. determining which mates are complimentary in function to the selected component.
38. An apparatus for accessing information used by a facility, comprising a computer readable memory having a plurality of memory addresses and containing a data structure stored therein, said data structure comprising:
 - a. a first table, stored in said memory, comprising a first plurality of records, each of said first plurality of records comprising:
 - i. a first data field including a component identifier corresponding to a component;
 - ii. at least one second data field including a part identifier corresponding to a part included in the component corresponding to said component identifier included in said first data field; and
 - iii. at least one third data field having information about the component corresponding to said component identifier included in said first data field;
 - b. a second table, stored in said memory, comprising a second plurality of records, each of said second plurality of records comprising a fourth data

field including information about the part corresponding to a part identifier included in said second data field; and

- c. a plurality of first pointers, each said first pointer pointing to a memory address at which a selected one of said second plurality of records in said second table is stored, each of said first pointers being associated with a part identifier included in said first table.

39. The apparatus of Claim 38 further comprising:

- a. a third table, stored in said memory, comprising a third plurality of records, each of said third plurality of records comprising at least one fifth data field listing at least one tool associated with at least one component; and
- b. a plurality of second pointers, each said second pointer pointing to a memory address at which a selected one of said third plurality of records in said third table is stored, each of said second pointers being associated with a component identifier included in said first table.

40. The apparatus of Claim 39, wherein each of said fifth data fields of said third plurality of records comprises an identifier identifying a tool used to extract a part from a selected component.

41. The apparatus of Claim 39, wherein each of said fifth data fields of said third plurality of records comprises an identifier identifying a tool used to insert a part into a selected component.

42. The apparatus of Claim 39, wherein each of said fifth data fields of said third plurality of records comprises an identifier identifying a tool used to crimp a part of a selected component.

43. The apparatus of Claim 38 further comprising:

- a. a fourth table, stored in said memory, comprising a fourth plurality of records, each of said fourth plurality of records comprising at least one sixth data field comprising visual information about a selected component; and
 - b. a plurality of third pointers, each said third pointer pointing to a memory address at which a selected one of said fourth plurality of records in said fourth table is stored, each of said fourth pointers being associated with a component identifier included in said first table.
44. The apparatus of Claim 43, wherein at least one of said sixth data fields comprises a pin diagram of a connector.
45. The apparatus of Claim 43, wherein at least one of said sixth data fields comprises a drawing of a connector.
46. The apparatus of Claim 43, wherein at least one of said sixth data fields comprises a digitized photograph of a connector.
47. The apparatus Claim 38, wherein a set of said third data fields of said first table comprises text information about a selected connector.
48. The apparatus of Claim 38, wherein said second table further comprises information about connector backshells.
49. The apparatus of Claim 38, wherein said second table further comprises information about connector contacts.
50. The apparatus of Claim 38, wherein said second table further comprises information about connector sealing plugs.

51. The apparatus of Claim 38, wherein at least one of said third data fields includes at least one value corresponding to a component attribute.
52. The apparatus of Claim 51, wherein said value comprises a code indicating a categorization of a material from which a corresponding part is constructed.
53. The apparatus of Claim 51, wherein said value comprises a code indicating a temperature rating associated with a component.
54. The apparatus of Claim 51, wherein said value comprises a code indicating a class code that categorizes a part based on a constituent material and a temperature rating associated with a component.
55. The apparatus of Claim 38 further comprising:
 - a. a fifth table, stored on said memory, comprising a fifth plurality of records, each of said fifth plurality of records comprising at least one seventh data field in which is stored a platform identifier and a eighth data field in which is stored at least one component identifier identifying a component on a platform corresponding to a selected platform identifier included in said fifth plurality of records; and
 - b. a fourth pointer to a memory address at which a selected one of said first plurality of records is stored, said pointer being associated with a platform identifier selected from said fifth table.
56. A computer system for accessing information about a plurality of components, comprising:
 - a. An apparatus for accessing information used by a maintenance facility, comprising a computer readable memory having a plurality of memory addresses and containing a data structure, the data structure comprising a table, stored in said memory, comprising a plurality of records, each of said plurality of records comprising:

- i. a first data field including a component identifier corresponding to a component; and
 - ii. at least one second data field including a value for an attribute associated with the component;
 - b. a computer processor; and
 - c. a memory storing a program to direct the processor to:
 - i. access said table;
 - ii. receive input from a user indicating a selection by the user of a component identifier in said table corresponding to a primary component;
 - iii. comparing, using preselected criteria, at least one value corresponding to at least one selected attribute associated with the primary component to each said second data field of a set of said plurality of records, thereby determining which components are acceptable substitutes for the primary component; and
 - iv. generating and displaying a list of components so determined to be acceptable substitutes for the primary component.
57. The computer system of Claim 56 further comprising:
- a. a plurality of remote terminals; and
 - b. a data communications network that connects at least one of said remote terminals to said computer processor, thereby allowing a user to access said computer readable memory from a remote location.
58. An apparatus for comparing components to determine which of a set of components is an acceptable substitute for a primary component, each of the components having at least one attribute, comprising:
- a. a computer readable memory;
 - b. means for accessing a set of data, stored in said memory, comprising a plurality of component identifiers, each of said component identifiers corresponding to a component, and a plurality of values, each of said

values corresponding to a particular attribute associated with a component corresponding to one of said plurality of component identifiers;

- c. means for selecting a primary component identifier of said plurality of component identifiers, said primary component identifier corresponding to the primary component;
- d. means for comparing, using preselected criteria, at least one value corresponding to at least one selected attribute associated with the primary component to a set of said plurality of values, thereby determining which components are acceptable substitutes for the primary component; and
- e. means for generating and displaying a list of components so determined to be acceptable substitutes for the primary component.

- 59. The apparatus of Claim 58, wherein the comparing means comprises a digital computer programmed to compare the value corresponding the selected attribute to the plurality of values.
- 60. The apparatus of Claim 59, wherein the selected attribute is a temperature rating associated with each component and wherein the comparing means comprises a computer programmed to determine if the value for primary component is equal to each one of said set of said plurality of values.
- 61. The apparatus of Claim 59, wherein the selected attribute is a temperature rating associated with each component and wherein the comparing means comprises a computer programmed to determine if the value for primary component is equal to each one of said set of said plurality of values.
- 62. The apparatus of Claim 59, wherein the selected attribute indicates a constituent material associated with each component with each value for the selected attribute corresponding to a quality rating number and wherein the comparing

means comprises a computer programmed to determine if the value for primary component is equal to each one of said set of said plurality of values.

63. The apparatus of Claim 59 further comprising means for determining if the value for the primary component is greater than each one of said set of said plurality of values.
64. The apparatus of Claim 59 further comprising:
- a. a plurality of remote terminals; and
 - b. a data communications network that connects at least one of said remote terminals to said computer, thereby allowing a user to access said computer readable memory from a remote location.
65. An apparatus for selecting at least one component from a set of components, each of said components having at least one attribute, comprising:
- a. a computer readable memory;
 - b. means for accessing a set of data, stored in said memory, the set of data comprising a plurality of component identifiers, each of said component identifiers corresponding to a component, and a plurality of values, each of said values corresponding to an attribute associated with a component corresponding to one of said plurality of component identifiers;
 - c. means for entering into the computer a selected attribute of a desired component;
 - d. means for entering into the computer at least one first value corresponding to the selected attribute associated with the desired component;
 - e. means for comparing the first value to a subset of said plurality of values, thereby determining which of the components are associated with the selected attribute having a value equal to said first value; and

- f. means for generating and displaying a list of component identifiers corresponding to components so determined to have values of the selected attribute equal to said first value.
- 66. The apparatus of Claim 65, wherein the comparing means comprises a digital computer programmed to compare the first value to the plurality of values, thereby determining which of said plurality of values is equal to the first value.
- 67. The apparatus of Claim 66 further comprising:
 - a. a plurality of remote terminals; and
 - b. a data communications network that connects at least one of said remote terminals to said computer, thereby allowing a user to access said computer readable memory from a remote location.
- 68. A method of assessing fees for access to a data base by a user having an account, comprising the steps of:
 - a. designating at least one selected first display of information stored in the database and accessible by the user as a pay screen;
 - b. recording at least one instance of the user accessing the pay screen; and
 - c. assessing a predetermined fee for each recorded use of the pay screen by the user to the user's account.
- 69. The method of Claim 68, further comprising the steps of:
 - a. designating at least one second display of information stored in the data base as a non-pay screen;
 - b. determining whether the user has accessed a pay screen or a non-pay screen when the user accesses information from the data base; and
 - c. assessing the predetermined fee to the to the user's account only when the user has accessed a pay screen.

70. The method of Claim 68, further comprising the step of limiting access by the user to a preselected set of screens.

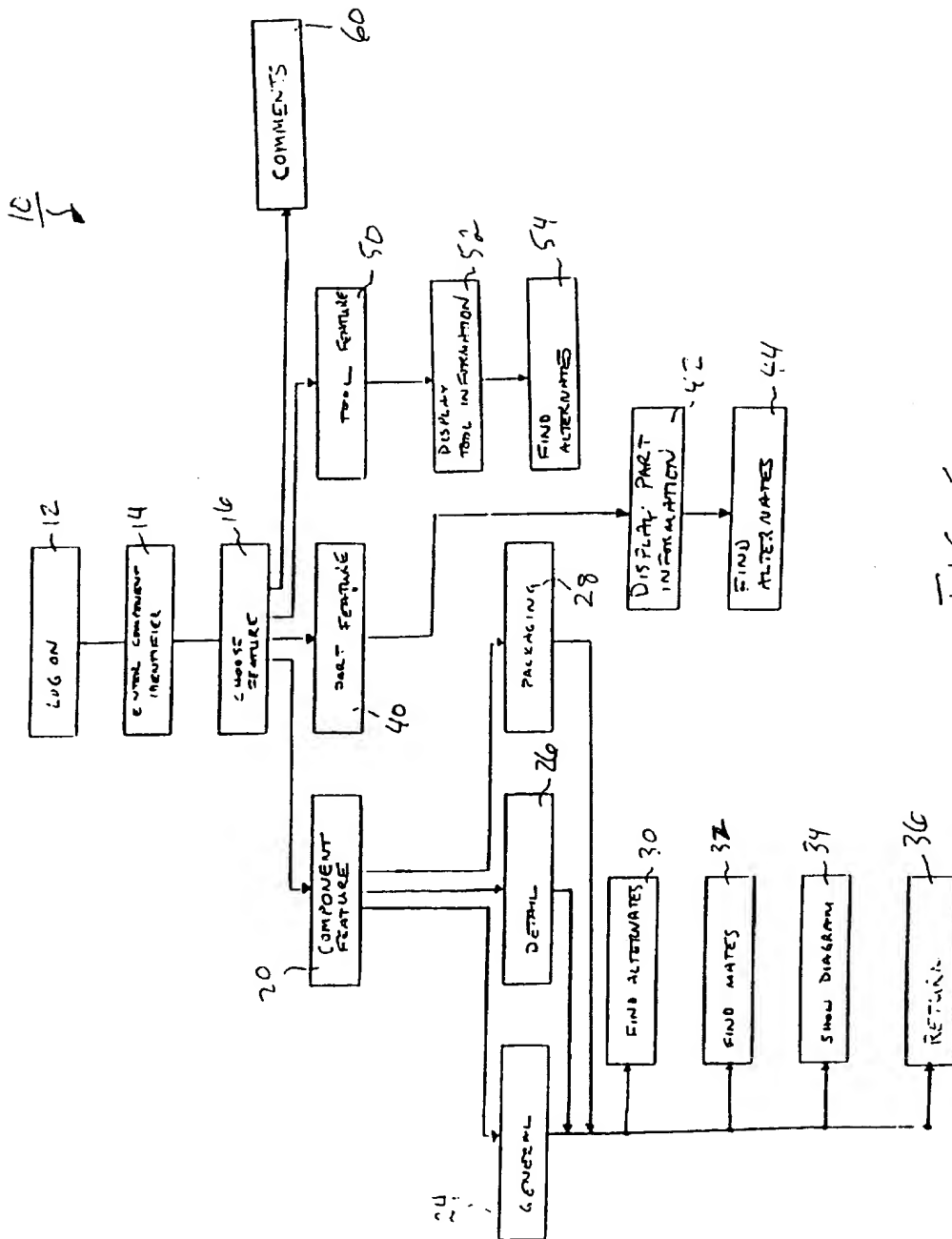


FIG. 1

Windows XP login screen. The title bar reads "Login". The desktop background is a dark blue/black image with a large, faint, stylized number "3" in the center. The login interface includes a "Log On" button in the top right, a "Username" label and text box on the left, and a "Password" label and text box on the right. A small icon with a question mark is in the bottom left corner.

MFG Part Number

DC37E22-41PN

BRW11

The screenshot shows the TransNet software interface. At the top, there is a menu bar with 'Main' and 'Help'. Below the menu bar is a toolbar with several icons. The main window displays a 'Cross Reference Card' menu with the following options:

- Connector
- Contacts
- Tooling
- Sealing Plugs
- Backshell
- Help

FIG. 2A

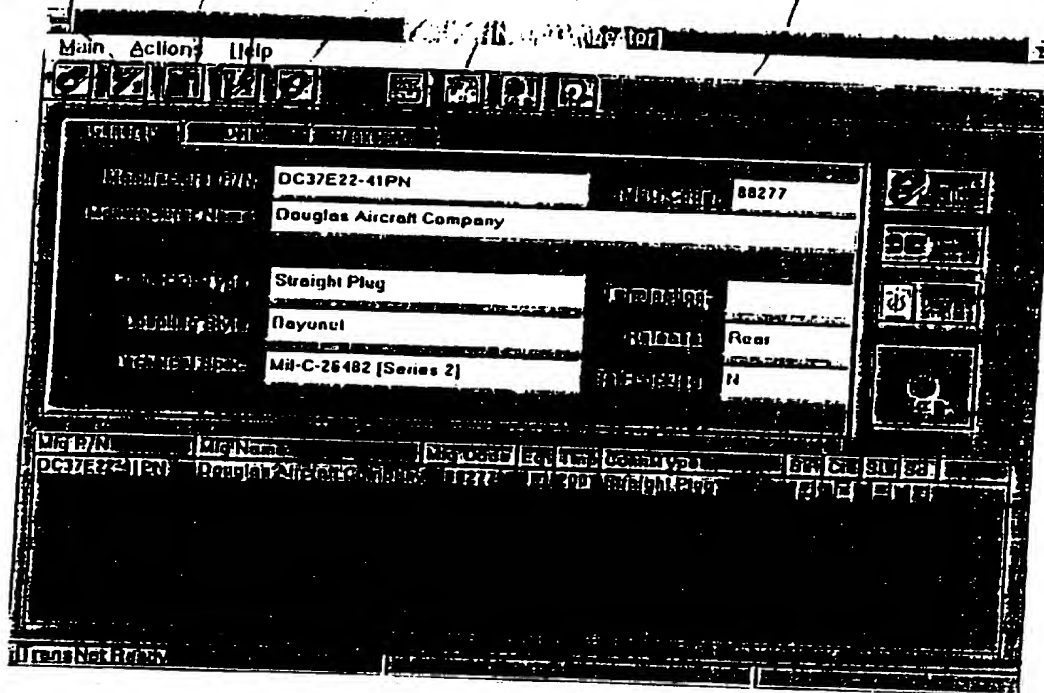


FIG 2B

TransNet - [Connector]

Main Actions Help

22-41

LE

22

200

Environmental, fluid-resistant RFI grounding connector - packaged w/ a grommet nut 8/S [No S/R].

This plug has a environment-resistant grommet seal along with an electrically conductive Aluminum alloy shell that is Nickel-plated.

Min P/N	Min Name	Min Code	Eq. Temp	Conn. Type	Box	Ch	St	Sd
0007070112N	0007070112N	0007070112N	0007070112N	0007070112N	0007070112N	0007070112N	0007070112N	0007070112N

TransNet Battery

FIG. 2C

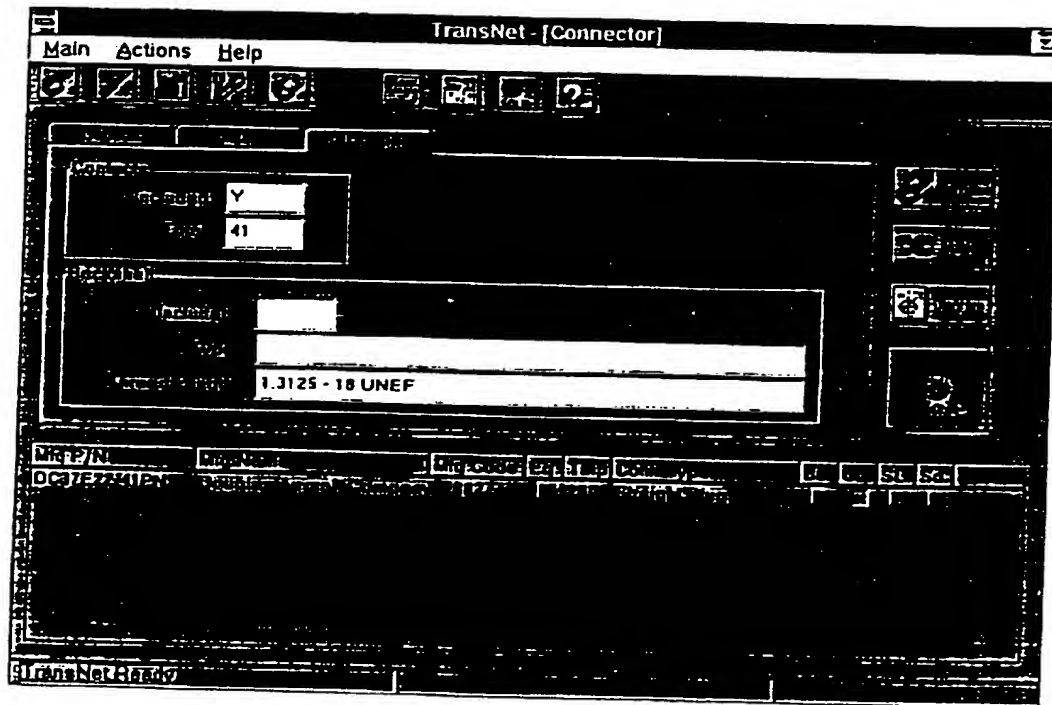


FIG. 2D

TransNet - [Connector]

Main Actions Help

Part Number: DC37E22-41PN Part Number: 88277

Manufacturer: Douglas Aircraft Company

Connector Type: Straight Plug

Pin Configuration: Bayonet

Pin Count: Rear

Pin Label: Mil-C-25482 (Series 2) Pin Label: N

Pin #	Pin Label	Pin Type	Pin Count	Pin Label	Pin Type	Pin Count
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9
10	10	10	10	10	10	10
11	11	11	11	11	11	11
12	12	12	12	12	12	12
13	13	13	13	13	13	13
14	14	14	14	14	14	14
15	15	15	15	15	15	15
16	16	16	16	16	16	16
17	17	17	17	17	17	17
18	18	18	18	18	18	18
19	19	19	19	19	19	19
20	20	20	20	20	20	20
21	21	21	21	21	21	21
22	22	22	22	22	22	22
23	23	23	23	23	23	23
24	24	24	24	24	24	24
25	25	25	25	25	25	25
26	26	26	26	26	26	26
27	27	27	27	27	27	27
28	28	28	28	28	28	28
29	29	29	29	29	29	29
30	30	30	30	30	30	30
31	31	31	31	31	31	31
32	32	32	32	32	32	32
33	33	33	33	33	33	33
34	34	34	34	34	34	34
35	35	35	35	35	35	35
36	36	36	36	36	36	36
37	37	37	37	37	37	37
38	38	38	38	38	38	38
39	39	39	39	39	39	39
40	40	40	40	40	40	40
41	41	41	41	41	41	41
42	42	42	42	42	42	42
43	43	43	43	43	43	43
44	44	44	44	44	44	44
45	45	45	45	45	45	45
46	46	46	46	46	46	46
47	47	47	47	47	47	47
48	48	48	48	48	48	48
49	49	49	49	49	49	49
50	50	50	50	50	50	50
51	51	51	51	51	51	51
52	52	52	52	52	52	52
53	53	53	53	53	53	53
54	54	54	54	54	54	54
55	55	55	55	55	55	55
56	56	56	56	56	56	56
57	57	57	57	57	57	57
58	58	58	58	58	58	58
59	59	59	59	59	59	59
60	60	60	60	60	60	60
61	61	61	61	61	61	61
62	62	62	62	62	62	62
63	63	63	63	63	63	63
64	64	64	64	64	64	64
65	65	65	65	65	65	65
66	66	66	66	66	66	66
67	67	67	67	67	67	67
68	68	68	68	68	68	68
69	69	69	69	69	69	69
70	70	70	70	70	70	70
71	71	71	71	71	71	71
72	72	72	72	72	72	72
73	73	73	73	73	73	73
74	74	74	74	74	74	74
75	75	75	75	75	75	75
76	76	76	76	76	76	76
77	77	77	77	77	77	77
78	78	78	78	78	78	78
79	79	79	79	79	79	79
80	80	80	80	80	80	80
81	81	81	81	81	81	81
82	82	82	82	82	82	82
83	83	83	83	83	83	83
84	84	84	84	84	84	84
85	85	85	85	85	85	85
86	86	86	86	86	86	86
87	87	87	87	87	87	87
88	88	88	88	88	88	88
89	89	89	89	89	89	89
90	90	90	90	90	90	90
91	91	91	91	91	91	91
92	92	92	92	92	92	92
93	93	93	93	93	93	93
94	94	94	94	94	94	94
95	95	95	95	95	95	95
96	96	96	96	96	96	96
97	97	97	97	97	97	97
98	98	98	98	98	98	98
99	99	99	99	99	99	99
100	100	100	100	100	100	100

FIG. 2E

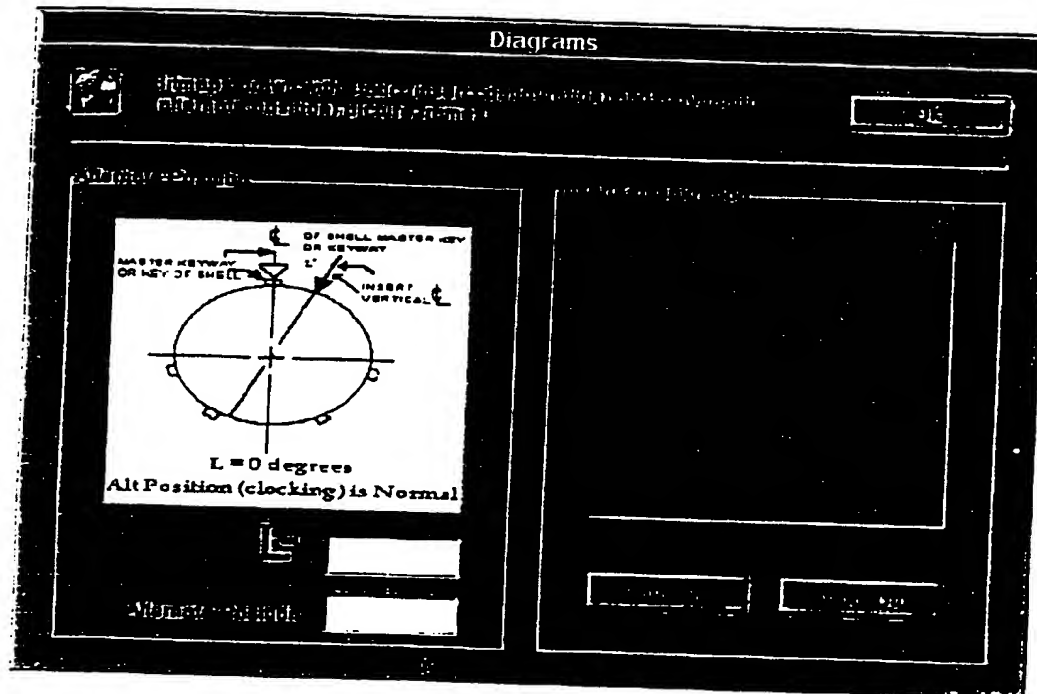


FIG. 2F

TransNet - [Contact]

Main Actions Help

DC38-20P 14283

Matrix Science Corporation [Amp. Inc.]

AWG: Pin 0

Reel: Reel

Temp: 200 Id-Plated Copper Alloy DC

Mfg P/N	Mfg Name	Mfg Code	Temp	Material	WB Flange
DC38-20P	Matrix Science Corporation	14283	200	Id-Plated Copper Alloy	24-28

TransNet Ready

FIG. 26

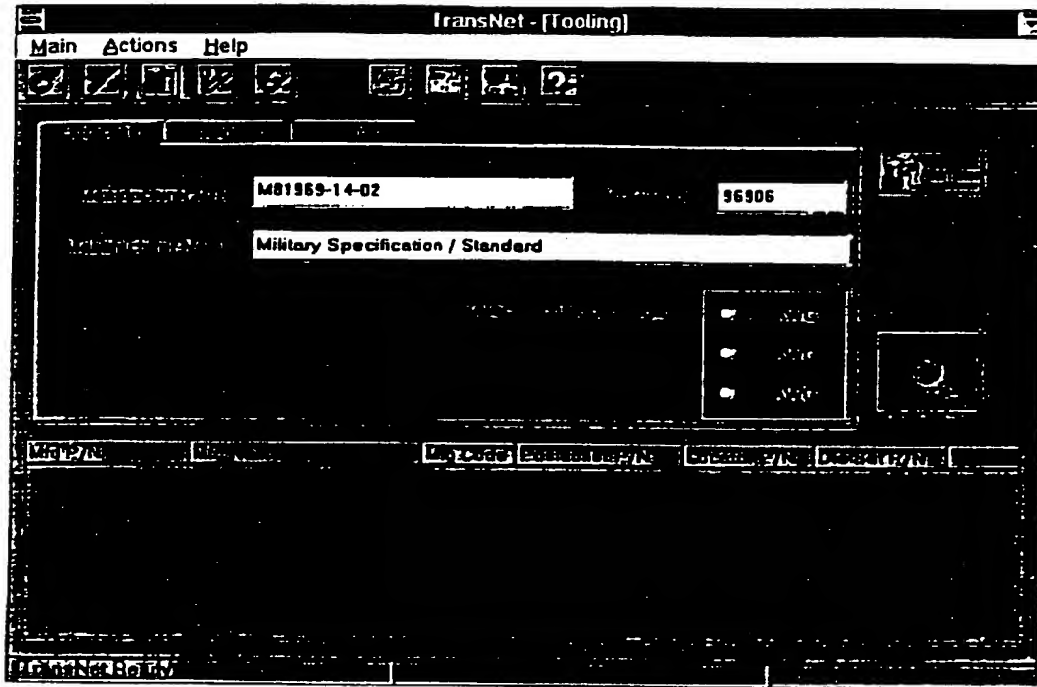


FIG. 21+

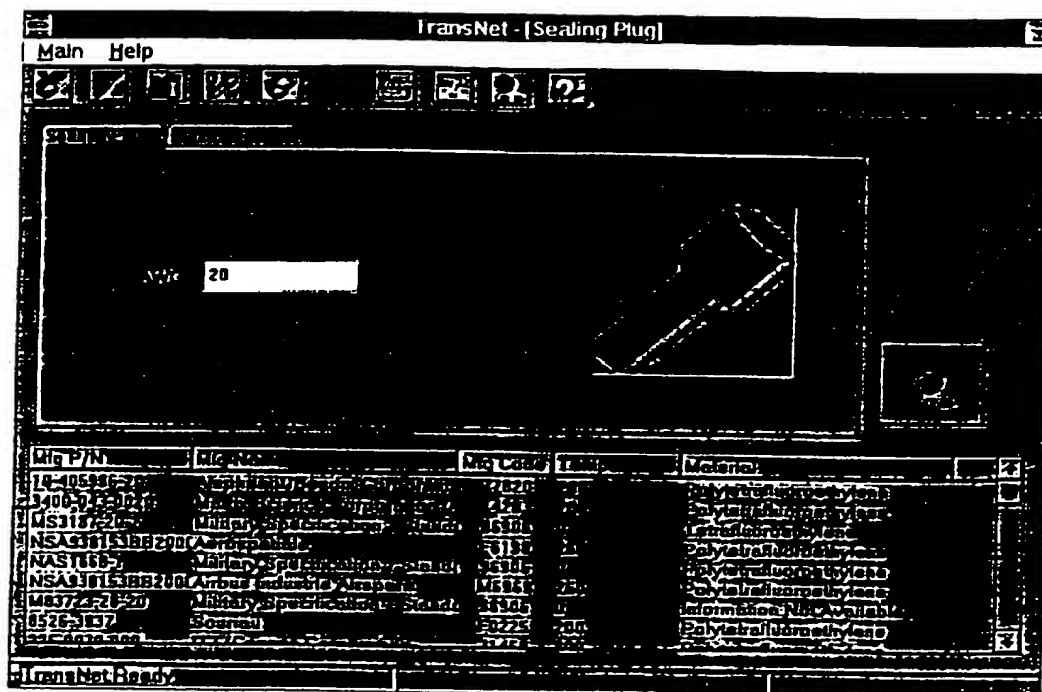


FIG. 2I

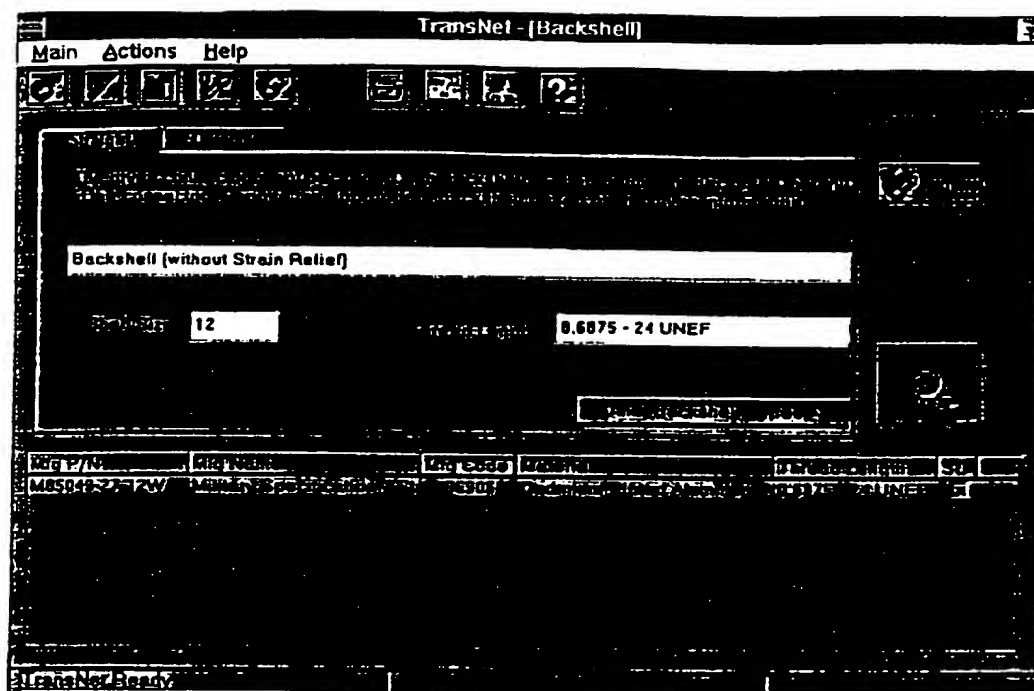


FIG. 25

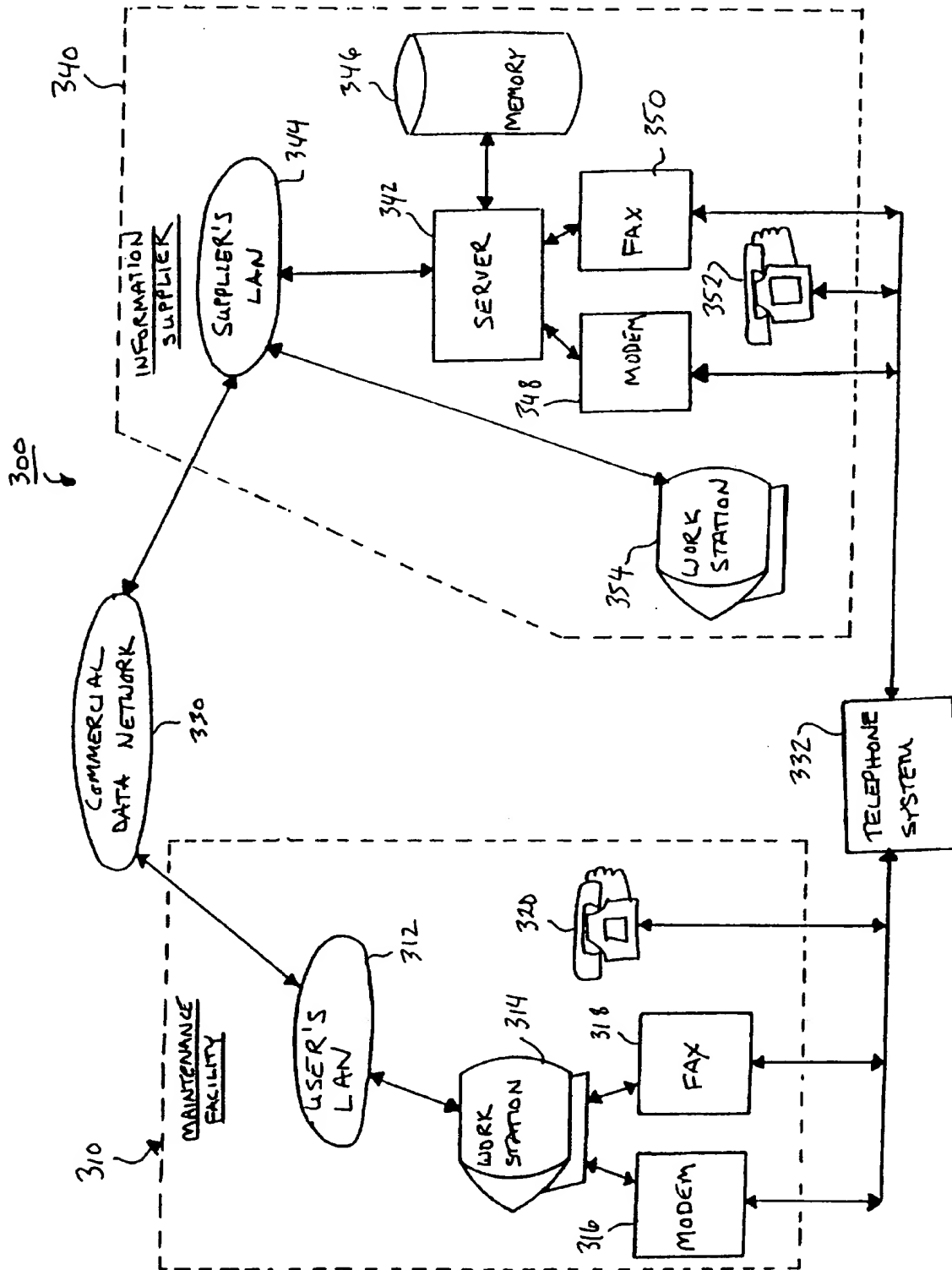


FIG. 3

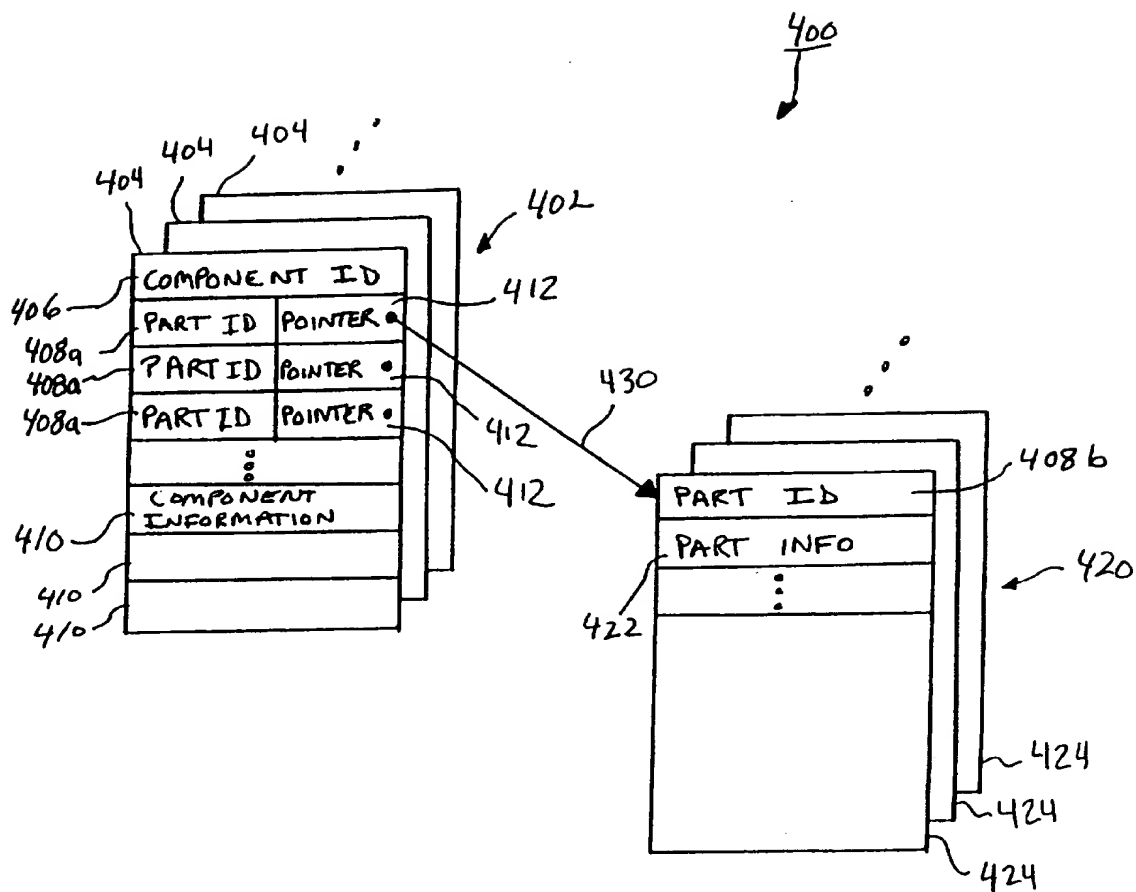
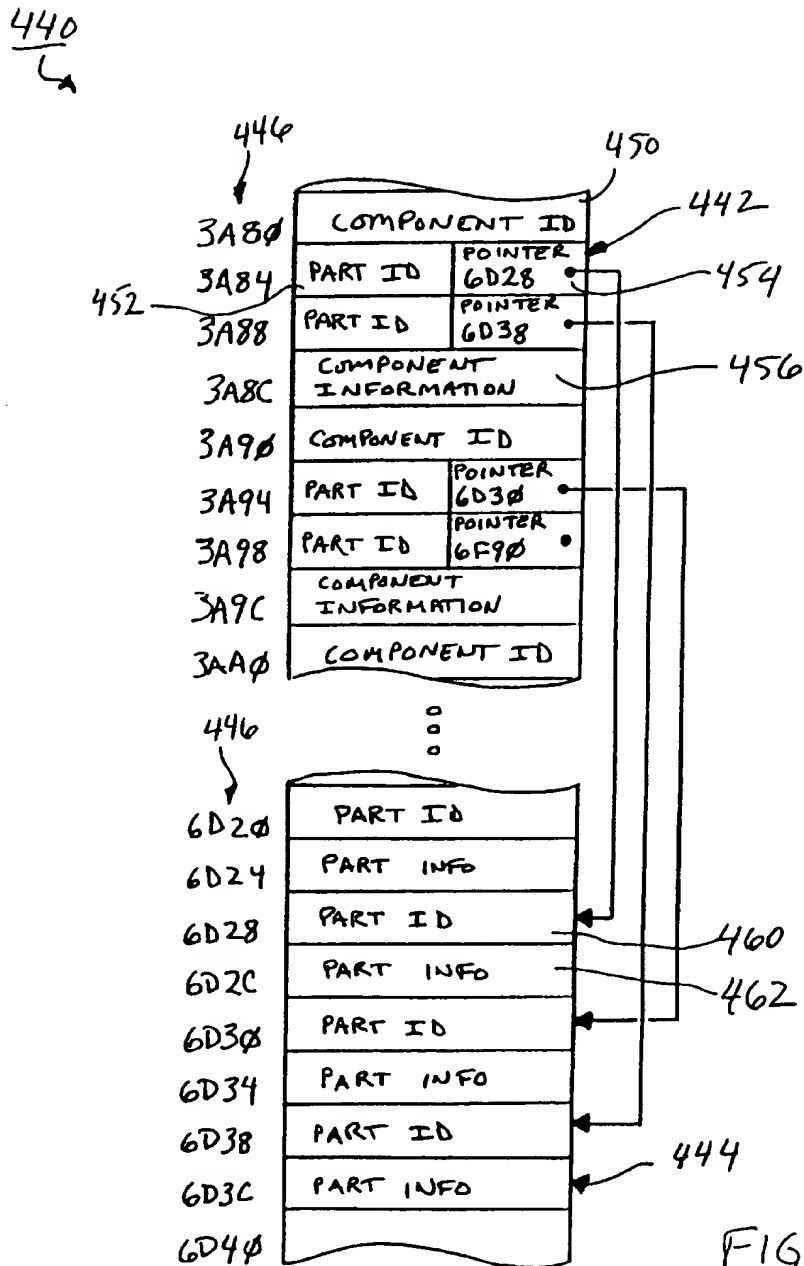


FIG. 4A



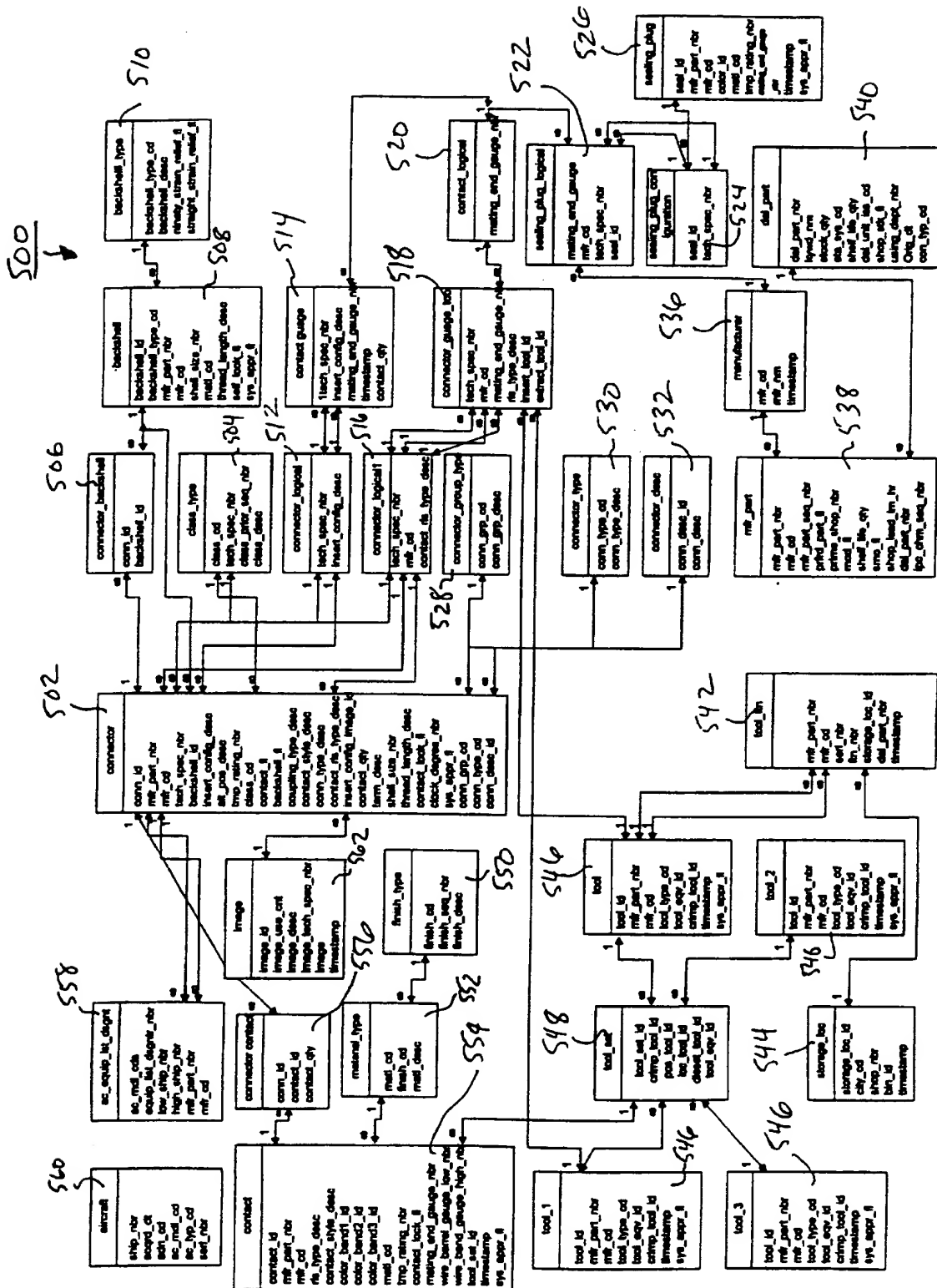


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US96/17881

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : G06F 7/00, 17/30

US CL : 395/601, 614

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 395/226, 601, 614; 414/281; 235/383; 379/113; 250/504R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS, IEEE

airline, aircraft, equipment list, distribution, warehouse, merchandise

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4,757,267 (RISKIN) 12 JULY 1988, fig. 1, 3, & 4A.	1, 3, 11, 15-18, & 25-33
X, E	US, A, 5,576,951 (LOCKWOOD) 19 NOVEMBER 1996, figs. 6 & 7, col. 6, & lines 21-41.	9-10, 13, 17-24, & 56-64
X	US, A, 5,063,507 (LINDSEY ET AL) 05 NOVEMBER 1991, figs. 1-3g.	1-70
A, E	US, A, 5,582,497 (NOGUCHI) 10 DECEMBER 1996, col. 3, lines 24-58, col. 8, & lines 17-43.	1, 16, 25, 38, 56, 58, & 65

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	
A document defining the general state of the art which is not considered to be of particular relevance	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principles or theory underlying the invention
E earlier document published on or after the international filing date	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	*A* document member of the same patent family

Date of the actual completion of the international search

29 JANUARY 1997

Date of mailing of the international search report

28 MAR 1997

Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

CHERYL LEWIS

Telephone No. (703) 305-8750

INTERNATIONAL SEARCH REPORT**International application No.**
PCT/US96/17881**C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 5,393,965 (BRAVMAN ET AL) 28 FEBRUARY 1995, figs. 1-11.	10, 12-13, 19-24, 28-37, 57, & 65-70

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☒ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☐ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☒ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.